

PAPER READ.

NOTES ON THE OCCURRENCE OF STILBITE IN THE ERUPTIVE ROCKS OF JAMBEROO, N.S.W.

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(Plate I.)

This zeolite is mentioned by Prof. Liversidge, M.A., F.R.S., as having been found in a few New South Wales localities,* but, as far as I am aware, it has not yet been reported from Kiama and its vicinity. While collecting specimens of the different eruptive rocks in the neighbourhood of Jamberoo, I observed a bright red mineral in some pieces of a dense, fine-grained basalt, obtained from the northern flank of "Wallaby Hill," an eminence on the south of the Minnamurra Valley. Shortly after, I found the same mineral in a porphyritic dolerite, not far from the locality just mentioned.

In either the basalt or dolerite, the mineral in question occurs almost invariably in more or less circular crystalline masses, from 5 to 100 mm. in diameter; but in one instance it was found to have filled up a small fissure in the surrounding rock, having spread itself as a crust of small crystals over the adjacent surfaces of the matrix. The cleavage planes of the individual crystals in the stellate groups (in which form the mineral occurs most frequently) show the characteristic pearly lustre of stilbite. The crystals are flat prisms whose cleavage is so perfect, parallel to their shorter planes, that it was easy to split off laminae sufficiently thin and transparent for microscopical observation by transmitted light.

In colour the mineral varies from a yellowish-white to purple-brown, but the most usual tints are flesh-red, scarlet, and brick-red.

* Minerals of N.S.W., 1888, p. 187.

Its hardness, tested at right angles to its cleavage, is above 3, calcite being easily scratched by it. Want of a sufficiently delicate balance prevented me from making an attempt to determine its specific gravity. The crystals are subtranslucent to opaque.

Before the blow-pipe the mineral gave the following reactions: it exfoliated, swelled up into curiously shaped white ramifications, fusing easily to an opaque white enamel. Moistened with cobalt nitrate and strongly ignited, the assay gave a somewhat dull blue mass, indicating presence of alumina. In the closed tube it yielded water readily. The powdered mineral was decomposed by hot hydrochloric acid, leaving after evaporation the silica as a somewhat slimy powder. The filtered solution, after super-saturation with ammonia, gave with oxalic acid a distinct white precipitate of oxalate of lime.

I next examined a thin cleavage section under the microscope. Its appearance by central illumination when magnified 50 diameters is shown in Pl. I., fig. 1. Bright orange bands, more or less rectilinear, and of varying degrees of intensity of colour, traverse the section of the mineral parallel to each other. (The greater or less vividness of the tint, no doubt, depends on the thickness of the section at various points, as well as on the mass of pigment injected.) These bands are crossed at right angles by others having either the same colour or a brownish tint. Between these coloured stripes appear colourless or faintly yellow portions, while everywhere, but especially in the deeply coloured regions, groups of black dots are visible, often arranged into lines running parallel to the orange bands mentioned above. Irregularly scattered over the colourless or faintly yellow parts of the slide are small patches of a bright yellow or orange tint, encircling a greater or less number of small black particles. At the point marked A in Pl. I., fig. 1, these crystallites are arranged in lines concentric with the contour of the surrounding colour patch. Prof. Zirkel, in his "Beschaffenheit der Mineralien und Gesteine,"* states that these

* *Op. cit.*, p. 167.

black spots are the pigment which gives to stilbite its various shades of colour, and that they are microscopic crystals of either göthite, limonite, or perhaps red hematite, the mineral itself being originally colourless.

Pl. 1., fig. 2, represents an almost colourless section of stilbite, only a few yellow spots being visible, but the orange bands are almost totally absent, while comparatively few of the black crystallites are present. In a similar specimen, unfortunately lost by an accident in mounting, I observed some beautiful dendrites of a bright sulphur-yellow, and as perfectly developed as the macroscopic dendrites of manganese oxide so often found on the cleavage planes of schists, slates, &c.

The occurrence of these dendritic aggregates tends to prove, to my mind, conclusively, that the pigment of red stilbite entered the mineral by the process of secondary infiltration of a solution of hydrated per-oxide of iron, derived from the hydration of the magnetite in the surrounding basalt. The solution has spread itself between the thin laminae composing the prisms of stilbite, having found its way through the hair-like cracks (due to shrinkage caused by the drying-up of the fluid in which the zeolite crystallized) which can be seen traversing the section in irregularly curved lines.

Between crossed Nicols the mineral proved to be anisotropic, suffering four extinctions in a complete revolution of the section. It is also very slightly pleochroic, the different tints darkening feebly when the section is rotated above the fixed polariser.